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D E C I S I O N
of 25 June 2003

Case Number: T 0801/00 - 3.4.2

Application Number: 91110658.1

Publication Number: 0464671

IPC: G01N 23/223

Language of the proceedings: EN

Title of invention:
System for analyzing metal impurity on the surface of a single crystal semiconductor by using total reflection of x-rays fluorescence

Patentee:
KABUSHIKI KAISHA TOSHIBA

Opponent:
GKSS-Forschungszentrum Geesthacht GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 56, 114(2)
EPC R. 64(b)

Keyword:
"Admissibilty of the appeal (yes)"
"Late filed documents (not admitted)
"Inventive step (yes)"

Decisions cited:
T 0252/95

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0801/00 - 3.4.2

DECISION
of the Technical Board of Appeal 3.4.2
of 25 June 2003

Appellant: (Opponent)
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Decision under appeal: Decision of the Opposition Division of the European Patent Office posted 9 June 2000 rejecting the opposition filed against European patent No. 0464671 pursuant to Article 102(2) EPC.

Composition of the Board:

Chairman: E. Turrini
Members: A. G. Klein
B. J. Schachenmann

Summary of Facts and Submissions

I. The opposition raised against the European Patent No. 0 464 671 (Application No. 91 110 658.1) on the ground under Article 100(a) EPC that its subject-matter lacked novelty and inventive step in view in particular of the contents of the following documents:

O1: EP-A-0 224 245,

O2: DE-A-3 938 193, and

O3: "Physik, Ein Lehrbuch zum Gebrauch neben Vorlesungen", Dr Christian Gerthsen, Dr Hans O. Kneser, 9. Auflage, Springer Verlag, Berlin, Heidelberg, New York 1966, pages 405 to 409

was rejected by the opposition division.

Claim 1, the only independent claim of the set of claims as granted, reads as follows:

"1. A total reflection fluorescent X-ray analyzing system including an X-ray source (1), a stage (4) for samples to be analyzed and a detector (5) for allowing X-rays (L_1) for excitation to be incident onto the surface of a measurement sample (3) comprised of a semiconductor single crystal at an angle less than a total reflection angle to measure a light quantity of fluorescent X-rays (L_3) from said measurement sample generated by excitation, thus to conduct an analysis with respect to a surface metal impurity of the measurement sample (3) on the basis of the measured result,

characterized by comprising:
measurement sample drive means (4) allowing a combination of a translation movement of the stage in two directions perpendicular to each other, said directions being contained in the plane of the stage supporting the sample, and a rotary movement of the stage in said plane, wherein when it is assumed that an arbitrary interplanar spacing of said measurement sample (3) is d, a wavelength of said X-ray is λ, an irradiation angle that said X-ray (L_1) and the lattice surface of said measurement sample form is θ, and an arbitrary integer is n, said measurement sample drive means (4) is adapted to carry out positioning of sample points by moving said measurement sample (3) under the state where the orientation with respect no said X-ray (L1) of said measurement sample (3) is fixed so as to satisfy the condition described below to thereby allow sample points (P) to be subjected to positioning:

$2d \sin \theta \neq n\lambda$."

The opposition division in its decision ruled that the features of the characterising part of claim 1 according to which the measurement sample drive means was adapted to carry out positioning of sample points so as to satisfy the formula set out at the end of the claim had no restricting effect since they described a method step. The claimed system was therefore distinguished from the closest prior art systems of documents O1 and O2 in that the measurement sample drive means allowed a combination of a translation movement in two directions perpendicular to each other and contained in the plane of the stage supporting the sample, with a rotary movement of the stage within said

plane. However, nothing in the documents cited by the opponent suggested to provide the stage with drive means allowing a rotation of the stage in the plane supporting the sample. Document O3 in particular only disclosed a tilting of the sample stage out of its plane, and it did not relate to the same technical field as documents O1 and O2 (see point 8 of the reasons).

II. The appellant (opponent) filed an appeal against the rejection of the opposition.

In its written submissions he relied upon the following citations which had not been considered in the opposition procedure:

O9: EP-A-0 318 012;

O10: DE-A-2 727 505;

O11: ATOMIKA " A typical Analysis Report from XSA 8000"; and

O12: Catalogue "Systemelemente", Spindler & Hoyer, 1984/1985.

III. Oral proceedings were held on 25 June 2003 at which the appellant requested that the patent be revoked.

The respondent (proprietor of the patent) as its main request requested that the appeal be rejected as non-admissible. The respondent also submitted auxiliary requests to the effect that the appeal be rejected as non-substantiated, that the documents filed by the

appellant during the appeal procedure be rejected as late-filed and that the case be remitted to the first instance, respectively.

The Board announced its decision at the end of the oral proceedings.

IV. In support of its request the appellant submitted that the appeal had been adequately substantiated in the statement of the grounds of appeal, by reference in particular to the arguments already presented before the first instance. There was no reason to repeat these arguments *in extenso*.

The additional citations referred to in the appeal proceedings were sufficiently relevant to be admitted, and document O9 had already been considered by the examining division and had led to limitation of the claims then on file.

The subject-matter of claim 1 was entirely anticipated by the contents of documents O9 and O10 because the skilled reader would have read on these documents the capacity of the measurement sample drive means disclosed there to perform the translation and rotation movements set out in the claim. The striving toward an ever increasing number of degrees of freedom of sample stages was indeed a natural development and the selection of a given number of degrees was only a matter of costs. If maintained, the present claim 1 would in effect forbid any further use of the total reflection fluorescent x-ray analysing technology, because it covered any analysing system provided with a measurement sample drive means allowing for two

perpendicular translation movements and a rotary movement about an axis orthogonal to the translation directions, independently of the purpose of such movements.

V. The respondent submitted that the appeal was not admissible because it was founded, apart from a mere unsubstantiated reference to the arguments put forward before the first instance, only on new citations. These citations should not be admitted into the procedure because of their late filing.

In any case, the citations on the file did not even address the technical problem of avoiding that Bragg reflected x-ray radiation may impinge upon the detector. Neither do these citations suggest the claimed solution of providing measurement sample drive means specifically adapted to orient the measurement sample so as to satisfy the condition set out at the end of the claim.

Reasons for the Decision

1. *Admissibility of the appeal*

In its statement of the grounds of appeal the appellant, on the one hand, referred generally to the submissions made before the first instance. On the other hand, it submitted a detailed argumentation based on new citations O9 to O11 to demonstrate that the claimed subject-matter lacked novelty and inventive step.

According to established case law of the boards of appeal an admissible appeal can be entirely based on new facts (see decision T 252/95, not published in the OJ EPO, point 1 of the reasons), and the arguments presented by the appellant in respect of the new citations are sufficiently clear to enable the board and the other party to understand immediately why the attacked decision is alleged to be incorrect and to which extent it should be cancelled.

For these reasons already the appeal complies with the formal requirements of Article 108 and Rule 64(b) EPC. It is accordingly admissible.

2. *Proper construction of claim 1*

The opposition division in the attacked decision considered that the features of claim 1 according to which the measurement sample drive means is adapted to carry out positioning of sample points by moving said measurement sample under the state where the orientation with respect to incident x-ray of said measurement sample is fixed so as to satisfy the condition

$$2d \sin \theta \neq n\lambda$$

did not have any restricting effect, since they described a method step and that these features were not to be taken into account for the assessment of patentability of the subject-matter of claim 1 of the patent (see paragraph 8.2 of the reasons). This view was shared by the appellant.

The respondent for his part insisted that the expression "adapted to carry out positioning..." in the claim did not simply mean that the sample drive means was "suitable" for carrying out such positioning. This expression in effect restricted the scope of the claim to an analysing system having sample drive means structurally arranged or specifically programmed to actually achieve the positioning defined in the claim.

The board concurs with the respondent's view. The statement in claim 1 that the sample drive means is adapted to carry out positioning of sample points by moving the measurement sample in a specific way is a functional definition of the drive means, which must indeed be so arranged as to actually achieve such positioning. This construction is entirely consistent with the description of the patent, which explains in detail the negative effect of Bragg reflection in the prior art x-ray analysing technique, where it resulted into lowered sensitivity and longer measurement time (see column 3, lines 7 to 31), and defines the technical problem underlying the claimed invention as consisting in providing a total reflection of x-ray fluorescence analysing system capable of immediately conducting measurement at a high sensitivity (see column 3, lines 35 to 39). To meet this object it is not sufficient that the measurement sample drive means allow a combination of a translation movement of the stage in two directions perpendicular to each other, said directions being contained in the plane of the stage supporting sample, and a rotary movement of the stage in said plane as is set out in the first portion of the characterising part of claim 1. Avoidance of Bragg reflection towards the detector can only be

achieved if the positioning of the sample is also carried out by the measurement sample drive means so as to actually satisfy the condition set out at the end of the claim.

For these reasons, the second portion of the characterising part of claim 1 cannot be simply ignored and a fair construction of this claim implies that this second portion be considered as reciting a functional limitation of the measurement sample drive means arrangement.

3. *Admissibility of the late-filed documents*

Documents O9 to O12 were submitted only during the appeal proceedings, which is long after expiry of the delay for giving notice of opposition.

None of these documents addresses the technical problem underlying the patent in suit nor discloses or in any way suggests adaptation of measurement sample drive means to carry out positioning of sample points so as to avoid Bragg reflection of incident x-ray radiation towards a detector.

Therefore, taking into account their lack of relevance, late-filed documents O9 to O12 may be disregarded as provided for in Article 114(2) EPC.

4. *Patentability*

A total reflection fluorescent x-ray analysing system as set out in the preamble of claim 1 is known for instance from documents O1 (see the Summary and Figure 1) or O2 (see the Summary and Figure 1).

In these known systems, dependent on the angular position of the measurement sample relatively to the axis of the detector, Bragg reflection of the x-ray radiation onto the detector may happen, resulting in saturation of the detector, and consequent loss of sensitivity and increase of measurement time (see column 3, lines 7 to 31 of the patent in suit).

Accordingly, the object of the claimed system is to provide a system capable of immediately conducting measurement at a high sensitivity (see column 3, lines 35 to 39 of the patent in suit).

This object is met in accordance with the characterising portion of claim 1 by providing measurement sample drive means allowing a combination of a translation movement of the stage for the sample in two directions perpendicular to each other and contained in the plane of the stage, and a rotary movement of the stage in said plane, said measurement sample drive means being in addition adapted to carry out positioning of sample points so as to satisfy the particular geometrical condition set out at the end of the claim.

None of the documents on the file evokes the technical problem addressed by the patent, nor in any way suggests the claimed solution, which in substance consists in providing measurement sample drive means which - on the basis of the interplanar spacing of the measurement sample, of the wavelength of the x-ray radiation and of the angle which the x-ray radiation and the lattice surface of the measurement sample form - position said measurement sample so as to satisfy a particular geometrical condition.

The measurement sample drive means of the device of the document O1 only allow for a translation movement of the stage along perpendicular directions in the plane of the stage supporting the sample so as to position a predetermined portion of the sample under the detector (see the setting knob 8 in Figure 1) and a third translation movement in an orthogonal direction, (see arrow 14). The measurement sample drive means of the device of the document O2 allow for a tilting of the sample stage about an axis so as to set the angle of incidence of the x-ray radiation perpendicular to the detector axis (see Figure 1, arrows 29 and column 7, lines 19 to 23) and a translation along this axis (see arrow 28). The other documents on the file are not more relevant.

Thus, there is no hint in the prior art citations towards the claimed provision of sample drive means specifically adapted to position the sample points so as to avoid Bragg reflection, due account being taken of the interplanar spacing of the sample, wavelength of the x-ray radiation and irradiation angle formed by the x-ray radiation and the lattice surface.

The appellant's arguments against the patentability of the subject-matter of claim 1 were based mainly on an incorrect construction of claim 1, ignoring the limiting character of the functional definition of the measurement sample drive means.

For these reasons, the subject-matter of claim 1 involves an inventive step within the meaning of Article 56 EPC.

The same conclusion applies to the subject-matter of the remaining claims, by virtue of the in appendance to claim 1.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

P. Martorana E. Turrini